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ABSTRACT

Medicine and the concept of good health has a rich history from Hippocrates to the present. People have relied on herbs, magic, and many folk cures in the past, and only in the last few centuries have people understood the sciences of health including physiology, medicine, chemistry and many other associated sciences. The discussion in this booklet considers time, space, and spirit. Time refers to a sense of history; space refers to geography; and spirit refers to life and thought. Several chapters on the history and concepts of health, a time line related to the concepts, a map of the important geography of these concepts, a glossary of important terms, and a list of several study suggestions are included. (CW)

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Disease and Health

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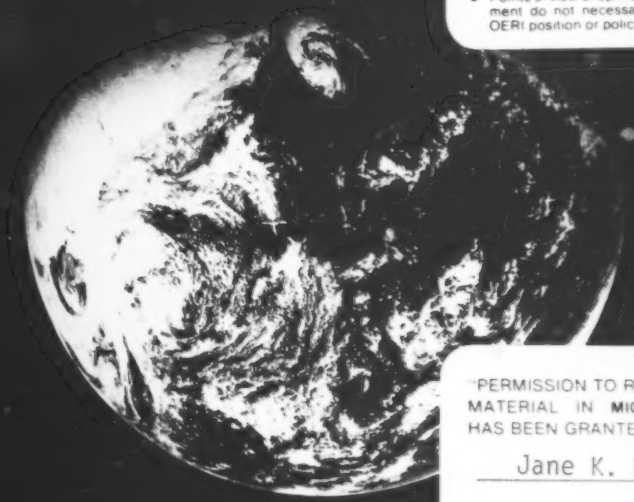

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A HAWKHILL LEARNING POWER BOOK

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TIME, SPACE AND SPIRIT

KEYS TO SCIENTIFIC LITERACY

To the student,

This short book will help you understand our modern world. It has changed a lot since your parents were born. Even more since you were born. And it will change still more–much more–in your lifetime.

What is behind most of these big changes? Two things. Science and technology.

What can you do about it? The first step is to understand more about science and technology and how they connect with our world. Especially the ever-growing world of free democratic societies. One way to do this–the way this book follows–is to look at the world from three angles: *Time, Space* and *Spirit.*

Time means history. You can learn how science and technology have worked in the past and are working today.

Space means geography. You can learn where important things happened in the past and are happening today.

Spirit means life. The life of the mind. You can learn the key words, concepts and ideas that power science and technology (and society) today.

This book teaches about science, technology and society from all three of these angles–*Time, Space* and *Spirit.*

Read on.

This book belongs to:

Disease and Health

Bill Stonebarger
Illustrations by Lin Haley

Hawkhill Associates
Madison, Wisconsin

This book is one of a series of sixteen Learning Power Books in the *Time, Space and Spirit–Keys to Scientific Literacy* series. It is designed to accompany the video program of the same name.

The *Time, Space and Spirit–Keys to Scientific Literacy* series was written and produced with consultation from the History of Science Department at the University of Wisconsin-Madison.

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a modern miracle

A few miles south of Paris there is a small village named Pouilly le Fort. It is a quiet, sleepy, typically picturesque French village today. Just a hundred years ago, however, a large crowd of doctors, government inspectors, farmers, reporters and public curiosity seekers were gathered here to witness a modern miracle.

Well, it wasn't exactly a miracle, though it seemed so at the time. It was a triumph, however, a scientific triumph, one of the most important in human history.

Louis Pasteur accepts a challenge

It happened on June 2, 1881. On the challenge of a local veterinarian, the famous chemist Louis Pasteur had come out from Paris to demonstrate to one and all, once and for all, that it was germs that caused disease. More important, he had found a way to kill germs and to prevent disease.

injections for anthrax

A few weeks before, Pasteur and his assistants injected twenty-four sheep, a couple of cows and a goat with a weakened anthrax bacteria. A control group of equal numbers was left without injection. Then, just a few days before June 2 all forty-eight sheep, all cows and goats were given lethal injections of the deadly anthrax bacteria.

saved by the vaccine

Now, with all present and eagerly holding their breath, Pasteur proudly let out into a field all of the sheep, cows and the goat that he had injected earlier with his new vaccine. All were in fine health, with nary a sniffle.

dead from anthrax

Pasteur then proudly led the crowd to another part of the field where twenty-two of the non-vaccinated sheep lay dead, while the other two were fast approaching death, all from anthrax.

Unfortunately all scientific demonstrations do not work that well. But for Louis Pasteur, a proud and contentious man, it was another in a series of dramatic personal triumphs over disease. Some of the first such triumphs in the long sad history of human disease and health.

Robert Koch

Pasteur was not the first person to believe that diseases could be caused by germs. In fact it was his contemporary, the German bacteriologist Robert Koch, who first isolated the bacteria that caused anthrax, as well as the bacteria that caused the most dreaded killer of the nineteenth century, tuberculosis.

disease not understood

Until Koch and Pasteur's time, humankind as a whole, all over the known and unknown world,

lived in almost total ignorance of the nature of disease. Theories to explain what caused disease, how to cure disease and how to avoid disease were almost as numerous (and sometimes as deadly) as the diseases themselves.

magic and astrology

All through the ages, people have relied heavily on magical and astrological theories. Disease was seen as an invasion of the body by evil spirits. The cure, therefore, must be found in magical words, objects or actions that could drive the evil spirits out of the body, and in so doing restore health. Ways of driving the evil spirits out ran a gamut from sacred herbs (which sometimes were helpful) to boring holes in the skill in order to let the spirits escape (seldom helpful).

religious theories

Magical theories have often existed side-by-side with religious theories. Disease was seen as a punishment given to humans by a vengeful god or gods. The cure, therefore, must be found in prayer, in change of heart or in sacrifices to the gods. Here, too, the remedies could be helpful as the patient gaining new confidence through faith and

prayer, or they might be as destructive as sacrificing human beings in order to appease the gods and spare the rest of the community.

good health and evil

In both magical and religious theories, good health is seen as the absence of evil–evil spirits or evil sin. The person enjoying good health is either just plain lucky or, more likely in the religious view, morally upright.

Hippocrates has a better idea

Sporadic attempts at a more scientific approach to disease and health were made in many of the world's first great civilizations. One of the most influential was made on the island of Kos in the eastern Mediterranean Sea. Here, in one of the world's first centers for healing, a man named Hippocrates worked to lay the groundwork for a more scientific approach to disease and health. "Diseases have natural causes" said Hippocrates, "and therefore, have natural cures."

rest, exercise and healthy habits

Thus, while medical experts in nearby and far-off places were trying to appease the gods or drive off the demons by sprinkling bat dung over doorsteps or nailing human heads onto poles, Hippocrates was calmly prescribing rest, exercise, herbs and healthy habits as more effective remedies.

good advice

Hippocrates also put into words some guiding principles of medicine and, indeed, of science. "It is valuable," he pointed out, "to know what attempts have failed, and why they have failed." His advice to a physician was as good then as it is now, "To help, or at least, to do no harm."

little progress for two thousand years

Despite this good advice, neither Hippocrates nor any of the succeeding schools of scientific medicine for the next thousand years made very much genuine progress in effectively treating disease. In fact, the sad truth is, the doctor of even a hundred years ago was almost as helpless as the doctor of two thousand years ago, or the medicine man or priest, when it came to actually preventing or curing any particular disease.

knowledge of anatomy and physiology lacking

One of the major problems was that people knew so little about how their bodies were constructed or how they worked. By the time our country was founded in the late 1700s advances had been made in descriptive anatomy, but physiology–the science of how the body parts worked–remained mostly guesswork.

pigs, apes and humans

The Roman physician, Galen, wrote some of the first scientific treatises describing the anatomy of the body. Because of long-standing taboos against dissecting human cadavers, however, much of his work was based on dissection of pigs and apes, and was highly inaccurate.

Vesalius takes a closer look

During the Renaissance, about the time Galileo was leading a revolution in our understanding of motion and astronomy, a man named Andreas Vesalius was looking more carefully at human bodies and correcting many of Galen's mistakes. Vesalius lectured in the most famous medical school in Europe, the University of Padua, Italy. Together with an artist, Jan Stephen van Calcar, he made some of the first visual aids for medicine–charts sketching the bones, the muscles, the organs of the body in scientific detail.

a change of attitude

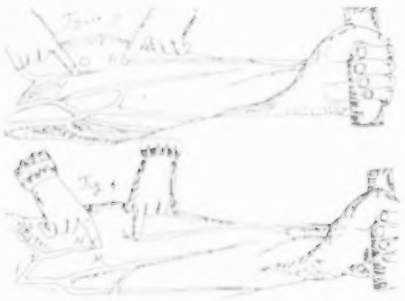
These new charts were not only more accurate than any Galen or his followers ever had, they also marked a sharp change in attitude and approach. When earlier artists made sketches of the body, they were artistic perhaps, but they never bothered to be accurate in their rendition of particular parts or organs. They were intended, instead, to symbolize the prevailing astrological, magical, herbal or scientific theory of the artist or author. Vesalius wanted to get the facts straight. The theory could come later.

physiology in infancy

Even the most careful and painstaking dissection of a dead human body, however, could never uncover many facts about how it worked in life. Physiology, the science of the working body, was still in its infancy.

William Harvey discovers how blood circulates

The first breakthrough in physiology came from an English physician in the early 1600s. William Harvey, in a carefully worked out set of experiments and observations, was the first to propose and to prove that the blood circulates around the body in one continuous loop. It is pumped by the heart, is supplied oxygen by the lungs, food by the intestines and feeds the body cells with this food and oxygen before returning to the heart for another push.

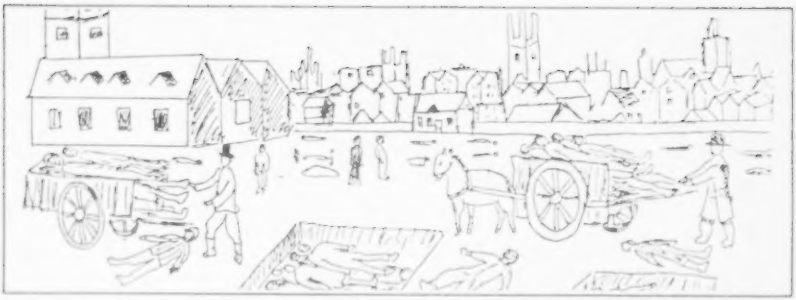


no improvement in health

Neither Vesalius nor Harvey had much effect on medical practice, however. Or on the terrible toll that disease had always taken and was still taking on human beings all around the globe.

diseases take terrible toll

Small pox, syphilis, bubonic plague, typhoid, cholera, tuberculosis, diphtheria. Whole towns,



whole countries would be decimated by these terrible diseases. More than once over a third of the entire population of Europe died in a plague called the Black Death. Smallpox was so common few people escaped having a pock-marked face. They were the lucky ones. Most people died.

a country doctor

Here at least–in smallpox–there was an early breakthrough. Around the time of the American Revolution a country doctor in England, Edward Jenner, discovered a way to prevent smallpox.

a breakthrough

Jenner noticed that milkmaids who got a similar but mild disease called cowpox never seemed to later get smallpox. Taking a chance, he injected himself and others with material from cowpox sores and found that this gave immunity to the dreaded smallpox. The basic technology of immunization had been discovered and given an early and successful trial. As yet no one knew how or why Jenner's vaccine worked, but it did work. That must surely rank as one of the greatest gifts humankind has ever received from science.

scurvy conquered

Another lucky guess led to a cure for another dread disease, scurvy. Crews on long ocean voyages often got this disabling and often fatal disease. No one knew why. A man named James Lind in 1747 used a refined folk medicine to discover a way to prevent scurvy. He found that sailors who sucked on lemons and limes would not get the disease. Hence British sailors were called "limeys." It would be many years later before we learned why it worked–the citrus fruit contained vitamin C, the lack of which, we know now, causes the disease.

need for basic science

These two examples were exceptions in that day. Progress was slow otherwise. One of the big problems was that curing disease and achieving health has always relied heavily on advances in basic sciences like physics, chemistry and biology. These sciences hardly existed in those early days.

chemistry just beginning

Chemistry, for instance, came into its own as a science only in the late 1700s, when men like Joseph Priestley, Henry Cavendish and Antoine Lavoisier began to unravel the mysteries of air, earth, water and fire.

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oxygen unknown

How could a doctor understand digestion or metabolism or respiration when no one up until the time of the American Revolution even knew there was a gas called oxygen, or an element called carbon. No one knew much about the chemistry of ordinary fire, much less human respiration.

microscope invented

How could a doctor know about germs until a city hall janitor in Delft, Holland named Anton van Leeuwenhoek, invented the microscope. In the seventeenth century Leeuwenhoek discovered a whole new world of life using his newly invented microscopes. He called these new microscopic plants and animals his "little beasties."

staining techniques

Once microscopes came into use, real progress toward understanding and controlling germ diseases became possible. Microscopes alone, however, were not enough. New laboratory techniques like ways to culture organisms and ways of staining and dyeing specimens, helped scientists identify and classify the microscopic germs they found in the blood of diseased patients.

Pasteur uses these new techniques

Building on such advances the chemist Louis Pasteur set up extremely productive laboratories in Paris, Strasbourg, Lille and in his ancestral home in the mountains in Arbois. Scientific work in these laboratories saved the French wine, beer and silk industries; cured rabies and prevented anthrax; proved life could only come from other life; and most important of all, cleared away once and for all much of the thousands-of-years-old fog and superstition that surrounded disease. Work in Pasteur's laboratories of-

fered genuine help to the poor physician in his age-old struggle to conquer pain and disease and to hold death at bay.

"one of the noblest chapters"

When the dam finally did break, the results were dramatic. Within the space of a few decades, humankind learned how to fight and conquer most germ diseases. Even the crusty cynic, H. L. Mencken, called it "one of the noblest chapters in the history of mankind." A chapter that brought giants like Pasteur, Koch, Ignaz Semmelweis, Paul Ehrlich, Florence Nightingale, Walter Reed and so many other physicians, nurses, public health officials, politicans and early environmentalists together to scientifically fight disease and restore health.

prevention and cure

What these pioneers did was one-by-one to discover the germs that caused diphtheria, tuberculosis, smallpox, childbed fever, syphilis, malaria, rabies and dozens of other scourges of humankind from time immemorial. Using the new knowledge of how the diseases were transmitted, progress could be made in community and individual sanitation to prevent epidemics. They also in many cases–not all–were able to find effective vaccines (ways to immunize people against these diseases). Sometimes, though not nearly as often, they also found a cure for the disease.

antibiotics and magic bullets

In the nineteenth century the groundwork was also laid for the modern hospitals of the twentieth century. In the twentieth century, new chemical antibiotics were discovered that could work miracle cures on diseases that were formerly fatal. Paul Ehrlich discovered an arsenic compound–they called it a "magic bullet"–that could cure

syphilis. Alexander Fleming found a common mold, penicillin, that could tackle and kill a host of germs that caused diseases.

half the children died before age of ten

So much happened so fast, it is hard for us today to realize the debt we owe these pioneers. Over fifty percent (that's right, one-half the children of England!) died before the age of ten in the sixteenth century. Before Pasteur, one out of twenty women who went to the maternity ward died in childbirth in the most advanced city in the world–Paris, France.

tuberculosis kills millions

Robert Koch, who discovered the bacteria that caused tuberculosis, pointed out in a speech to a Berlin audience in 1882 that "even the most dreaded infectious diseases, such as bubonic plague, Asiatic cholera, etc. must rank far behind tuberculosis. Statistics teach that one-seventh of all human beings die of tuberculosis, and that if one considers only the productive middle age groups, tuberculosis carries away one-third and often more of these."

surgery with no anesthetic

If you had surgery, the operation was unbelievably painful with no anesthetic beyond a glass of whiskey. To make matters worse, well over half of those who had surgery were doomed to a mercifully rapid death after the operation, as infection set in and took charge.

crippled by polio only a few years ago

In my own lifetime, thousands of children, some of them my friends, were crippled or killed by a disease called poliomyelitis. Scientists discovered a vaccine to prevent polio just in time to assure that my own children would not suffer from this terrible disease.

increase in life spans

As the new scientific knowledge of medicine came into being, the average life span leaped from twenty-five years to forty-five in the space of a few decades. And then in the twentieth century the progress has accelerated ever faster so that today the average life span in the developed world is over seventy-five years.

are all problems solved?

Does that mean that all our problems of disease and health are now solved?

Obviously not. But things are much better than they have ever been before. In the second part of this book we will look at disease and health today.

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a modern epidemic

There is an epidemic stalking the country today. Not too many people know about it. If it gets into the newspapers, it is on the inside pages. If it gets onto TV, it's not on prime time. If it gets into the magazines, on the posters or in government reports, it is seldom read.

It is an epidemic of wellness.

good news

Never in all of human history has there been such good news. Some hospitals are advertising because they don't have enough patients to fill their beds. Doctors worry that there may be too many doctors in the coming decades. Most people who do get sick are getting well faster and staying that way. Even in the most dreaded disease of all, cancer, the death rate is slowly beginning to decline. If it weren't for cigarette smoking, especially among young women, the decline would be greater.

wellness statistics

A few statistics to illustrate. Life expectancy in this country has increased steadily from forty-seven years in 1900 to over seventy-five years today. Age-adjusted death rates from heart disease, still the greatest killer, fell 18 percent between 1950 and 1970. Between 1950 and 1970 the death rate among young children fell 53 percent.

doomsday?

And yet the headlines and the best-selling books often read like a chamber of horrors. "Who's Poisoning America?" "The Plague on our Children" "The Politics of Poison." "The End of Nature."

cults and quacks

You find cults and quacks in every city and town, offering the latest fads from miracle diets to psychic surgery. All to cure what ails us. Which is often surprisingly little. As the doctor and best-selling author Lewis Thomas says "we seem to be a nation of healthy hypochondriacs, living gingerly and worrying ourselves to death."

So how can we today as a society and as individuals accelerate the century-long decline in disease, the century-long march toward wellness.

what caused the wellness epidemic?

First let's look at what caused the wellness epidemic. Here the answers are clear. Two things. Better science and higher living standards.

For the better science we can thank the thousands of scientists, physicians, nurses, engineers, politicians, environmentalists and citizens who have led the way and are still leading the way to a more scientific understanding and control of disease. And toward a better understanding and nurturing of health.

higher living standards

For the higher living standards–better food, better shelter, better and safer transportation, better means of communication and the thousand and one other economic and cultural advantages that come with the highest living standard in all of human history–for all this we can thank the millions of creative workers yesterday and today upon whose shoulders we all stand. Workers who had the chance to work hard in a creative way because they lived in a free society such as ours.

Some might want to add a third point. This rapid decline in disease is so new in human history we have not had time to do much, or even think much about the other side of the coin, human health.

to be "fully awake"

What would it be like to be exuberantly healthy? To be "fully awake" as the writer Henry David Thoreau once advised?

agenda for the future

Recognizing these three background facts leads to a plainly laid out agenda for the future as well. For oneself and for world society as a whole. Just as many diseases of the past were conquered long before there was an accepted theory of disease, so today we can move toward more vibrant health even though we may have disputes about what health is.

holistic health?

Some experts today, for instance, say we must adopt a more holistic approach to health. That means we must concentrate our attention on the whole body, or better yet, the whole society, rather than getting too specialized in treating the ailing organ alone. Too often, these people say, we treat the symptoms of a social problem, neglecting the root causes.

Other experts say this is the same approach that failed in earlier centuries. What is needed is not philosophy but instead an even more intense search for ways to cure specific ills. For ways to cure specific diseases, individual or social. Each small advance can then be a real advance. It can create knowledge that works. The same approach used so successfully in the past by Pasteur, Koch, Semmelweis and others.

AIDS, drugs and other disease epidemics

For two of the biggest health challenges we face today, drug abuse and the fatal epidemic disease, AIDS, we may need to rely on the wisdom in both of these approaches. In both drug abuse and AIDS, progress toward health will require new scientific knowledge but it will also require new movement in social dimensions.

Let's take a brief look at the big picture today. Where are we in our search for health?

diseases of past now prevented

In all ages of the world before 1900, by far the greatest number of deaths were from infectious diseases like typhoid, tuberculosis, smallpox and malaria. Today in the developed world deaths or crippling from infectious diseases are comparatively rare.

no time for complacency

This does not mean we can afford to be complacent, of course. Scientifically or socially. Children still need their immunization shots. All people need to be on guard to avoid exposure to infections and to deal promptly with them when and if they arrive.

AIDS

We do still have serious infectious diseases that come seemingly out of nowhere. Diseases like AIDS. It takes time for research to come up with vaccines or cures for new infectious diseases like AIDS even though we now know where and how to look for them. We also know effective ways to limit the chances of infection. In the case of AIDS, for instance, since it is transmitted only by intimate sexual contact, by blood tranfusions or by drug addicts sharing dirty needles, we also know what directions to take in order to reduce the risks of infection.

greatest killers–cancer and heart disease

By far the greatest killers today are heart disease and cancer. Neither of these is caused, so far as we know, by germs. Both attack older people much more frequently than young people. For the young the greatest health problems today are automobile accidents and drugs (especially alcohol and cigarette smoking).

what can you do about it?

What can we do about these killers?

Quite a bit. Plenty, as a matter of fact.

Just as immunization and antibiotics have proven their worth in preventing and curing infectious

diseases, rather small changes in life style have proven their worth in preventing heart attacks, reducing your chances of getting cancer and keeping you from getting maimed or killed in an automobile accident.

don't smoke

For instance. By far the biggest thing most people can do to keep from getting cancer or heart disease is simple enough–don't smoke.

don't drink and drive

Similarly, by far the biggest thing all of us can do to prevent automobile accidents is also very simple–don't drink and drive.

It is that simple. Do it.

better roads, seat belts and science

Now admittedly not smoking will not prevent all cancer, nor all heart disease. Nor will not drinking and driving prevent all automobile accidents. But these simple measures could cut the rates in half or more. For the other half, we have to rely partly on the advance of medical science in the case of cancer and heart disease, and on the engineering of roads and automobiles in the case of automobile accidents–as well as wearing seat belts and getting more effective driver education. And we are making progress on all these fronts.

radical medical interventions

Despite our unfortunate tendency to poison ourselves with cigarettes, alcohol and other drugs, radical medical intervention has been able to prolong life and increase healthful activity by such new techniques as heart bypass surgery, kidney dialysis, heart pacemakers, radiation, surgical therapy, etc. Unfortunately these radical medical interventions are very expensive. When research makes more progress into a detailed understanding of causes, the prevention and cure will be cheaper and more effective.

health aids

In the meantime, besides not smoking, there are other hints, both personal and environmental, that will help cut the chances of contracting heart disease or cancer. And for that matter the thousand and one other health threats that still and always will come with being alive.

what we eat and how much we eat

What we eat and how much we eat is without doubt the second most important factor. While there is a great deal of controversy among the experts here, there does seem to be some concensus too. At least on a few points.

being overweight

Like (1) not eating too much. That is, not becoming very fat. Being overweight increases your chances for heart attacks, cancer and a host of other unpleasant diseases. As well as cutting down your opportunities for healthy fun.

nutrition in foods we eat

And (2) eating too little of the right foods. What are the right foods? Despite all the hoopla, all the money, advertising and propaganda promoting health foods, fast foods, organic foods, vitamin foods, fiber foods and heaven only knows what kind of foods, the great weight of scientific evidence still says "moderation in all things." Stick to making sure you get some of the basic four food groups every day.

four basic food groups

What are they? (1) dairy products; (2) meat or fish; (3) fresh fruits and vegetables; and (4) breads and cereals (preferably whole grain ones).

less fat, more fiber

The evidence also seems to be accumulating that cutting down on fats and cholesterol, and increasing the amount of fiber in your diet are a good idea.

common sense and exercise

For the rest, three meals a day (with a good breakfast), plenty of vigorous exercise, seven or eight hours sleep, a good stretch of productive work and a healthy dose of fun and recreation. These kinds of common-sense things can do wonders to keep you healthy, wealthy and wise.

beware of fads

As part of this common sense approach to good health, one final caution. If you hear of, or read of, or are offered a tool for good health that is almost too good to be true–be warned. It almost certainly is not true.

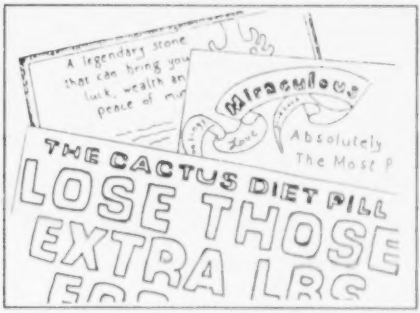
health quackery

Past history and present reality are pock-marked with health quackery. The shelves of the supermarkets and health food stores, the magazine racks of the newstands, even the stacks of the public library are chock full of tempting invitations to instant health. Lose weight overnight; cure baldness; develop busts; cure arthritis; miraculous herb; castus diet pills; vitamins for health;

minerals for health; feel happier and healthier in thirty days or your money back.

placebos or worse

Don't be taken in. As they say, a fool and his money are soon parted. More tragically, a fool and his health are soon ruined. At best, the majority of these highly touted health aids may make a few people feel better, as do "placebos" (see glossary) in standard medical practice. Rarely do they have any but chance effects on actual diseases. And rarely do they really do what they claim to do in promoting health, whether it be growing hair, expanding busts, preventing disease or protecting you from harmful chemicals.



community health

Besides counting on the medical profession to accelerate their research into the root causes of various health problems, besides doing all you can to protect yourself from diseases and promote your own health, there is a third ingredient of disease and health today that we all must pay attention to. That third ingredient could be called public health, or community health.

individual can't do it all alone

Diseases are not all caused by germs or unwise and unhealthy personal habits. Nor can we always be cured by doctors or by ourselves as individuals. Nor can we all or any one of us–alone–achieve the vibrant kind of health Thoreau talked about. In other words, we need each other. All over the community, all over the world.

pollution and environmental health

Gone are the days when an epidemic or war or drought or cloud of pollution or just plain craziness in one part of the world had little effect on another part of the world.

worldwide health

In these days of rapid transportation and almost instant communication, citizens of New England cannot isolate themselves from the toxic waste pollution coming from factory stacks in Chicago or St. Louis. Citizens of the United States, of India, of Germany, England, China or USSR cannot isolate themselves from the dangers of nuclear war. Nor from the dangers and the despair of poverty, prejudice, drug addiction and totalitarian suppression wherever it is found. Citizens in every country in the world, in other words, have a strong stake in the success or failure of citizens in every other country in the world.

health in the future

These are the realities in our modern world of disease and health and, like it or not, we must cope. How we cope, how we succeed or fail in these world-wide community challenges will have everything to do with the health of ourselves and our children and our children's children for the decades and for the new century to come.

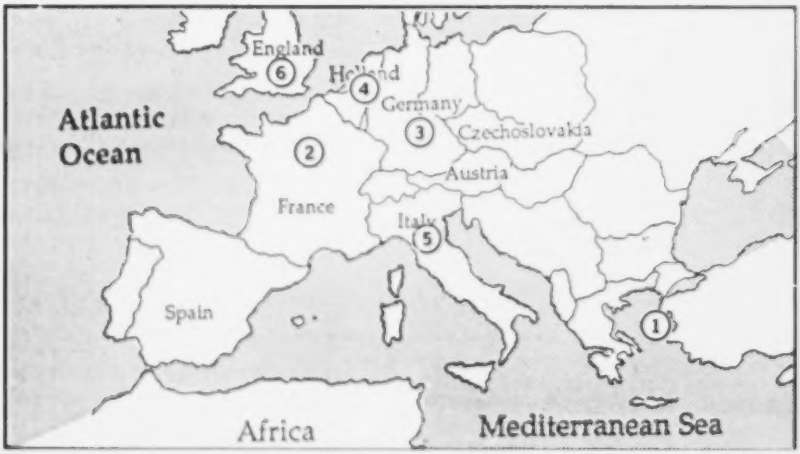
TIME ...

To understand the world of today it helps to know something about the world of yesterday. Kings and queens, wars and famines, presidents and paupers have all played a part. But more important than any of these in changing the past world into the world of today has been science and technology. The time line below will help you place important events and people in historical time.

EVENTS IN WORLD HISTORY		EVENTS IN SCIENCE & TECHNOLOGY
500 B.C. to A.D. 400 Roman Empire		
	1000	A.D. 1000 Epidemics lead people to think the world will end
500-1300 Medieval Europe	1100	
	1200	
	1300	14th Century One-third of Europe dies in Black Death
	1400	
1400 to 1600 Renaissance	1500	1550 Vesalius makes progress in anatomy
	1600	1665 Great Plague of London
	1700	
1775-1777 American Revolution	1800	late 18th century Jenner vaccinates for smallpox
1861-1865 American Civil War	1900	mid-19th century Pasteur, Koch and others conquer infectious diseases
1939-1945 World War II		late 20th century PCB, dioxin, radioactivity, acid rain and AIDS

SPACE ...

There is a saying, "If you don't know where you are going, any road will get you there." One of the important parts of knowing where you are going is a knowledge of geography. The map below will help you to locate the important events and people discussed in this book.



1. Kos — Greek island where Hippocrates founded scientific medicine.

2. France — Where Louis Pasteur pioneered new ways of immunizing against germ diseases.

3. Germany — Where Robert Koch, Paul Ehrlich and many others advanced knowledge of disease and ways to prevent disease.

4. Netherlands — Where Anton van Leeuwenhoek made the first microscope and discovered a new world.

5. Italy — Where Vesalius and Galileo worked in the Renaissance.

6. England — Site of many advances in medicine and health, including work of William Harvey, Edward Jenner, James Lind and Alexander Fleming.

SPIRIT...

Time and space are meaningless without spirit. Spirit is the part in each of us that understands. The part that sees connections between words and things–connections that surprise and make sense. Study the key words, concepts and ideas below so that you can understand how time, space and spirit have worked in the past–and are working today.

AIDS — A serious virus-caused disease for which there is at present no vaccine and no cure. (p. 16-17)

anesthetic — A chemical substance that is able to safely make you lose consciousness and not feel pain. (p. 11)

anatomy — The science that studies the way the human body (or other animal bodies) is constructed. (p. 5-6)

antibiotics — Chemical substances (usually produced by molds) that kill disease germs. (p. 11, 17)

bacteria — A microscopic living thing of only one cell. Most bacteria are harmless, some are helpful, and a few are harmful. (p. 2)

Black Death — A deadly epidemic that ravaged Europe many times during Medieval times, sometimes killing as many as one-third of all the people in a town or country. (p. 7)

cancer — A group of serious diseases in plants, animals and humans in which cells multiply without control. (p. 17-18)

digestion — The process of changing food into a form the body's cells can use. (p. 9)

Ehrlich, Paul — A German physician of the nineteenth century who discovered a cure for syphilis. (p. 10-11)

epidemic — A rapid multiplication of some disease in a certain area, large or small. (p. 6-7, 10)

Fleming, Alexander — A Scotch bacteriologist (1881-1955) who discovered the antibiotic power of penicillin. (p. 11)

Harvey, William — An English physician (1578-1657) who discovered and demonstrated that blood circulates in a closed circuit in the body. (p. 6)

Hippocrates — A Greek physician (460-360 B.C.) who pioneered one of the first scientific approaches to medicine. (p. 4)

immunization — Giving an injection or pill to make a person able to resist the germs of a particular disease. (p. 1, 7, 17)

Jenner, Edward — An English physician (1749-1823) who discovered how to vaccinate people to prevent smallpox. (p. 7)

Koch, Robert — A German bacteriologist (1843-1910) who discovered the bacteria that cause anthrax, tuberculosis and other diseases, and formulated a scientific method for understanding and controlling infectious diseases. (p. 2, 11)

Nightingale, Florence — An English nurse (1820-1910) who pioneered scientific and humanitarian ways of hospital care. (p. 10)

oxygen — An element important for life. Makes up about 20 percent of the atmosphere. (p. 9)

Pasteur, Louis — French chemist (1822-1895) who is generally credited with leading the way in the understanding and control of many infectious diseases in plants and animals, including human beings. (p. 1-2, 9-10)

physiology — The science that studies how animal and human bodies work. (p. 5-6)

placebo — A substance known to have no effect on the body. Used as a control in experiments. (p. 21)

polio — Short for poliomyelitis, a serious cripppling disease conquered by new vaccines in the 1950s. (p. 12)

pollution — When and where our air, water or soil is contaminated by unwanted substances. (p. 22)

respiration The basic process used by all animals to get energy by oxidizing food. (p. 9)

smallpox Formerly a serious, often fatal disease. No longer exists on earth because of success of smallpox vaccines. (p. 6-7, 16)

syphilis A serious disease transmitted through sexual contact. (p. 6, 10-11)

toxic waste Any unwanted substance that is poisonous to living organisms. A matter of degree. Toxic wastes can be more or less poisonous. (p. 22)

vaccine A substance injected into a plant or animal that protects it from getting some disease. (p. 1-2, 7, 10)

In addition to the above, *Disease and Health* also teaches about other important people, places, things and ideas. Often you can figure out the meaning of a new word by seeing how it is used in context. Make sure you know the meaning of the following. For help, check the pages listed in this Learning Power Book, as well as your dictionary and encyclopedia:

anthrax (p. 2, 9); **arsenic** (p. 10); **astrology** (p. 3); **cholera** (p. 4); **diphtheria** (p.6, 10); **Galen** (p. 5-6); **Galileo** (p. 5); **heart bypass** (p. 19); **holistic medicine** (p. 16); **Leeuwenhoek, Anton van** (p. 9); **life expectancy** (p.12, 14); **Lind, James** (p. 8); **lung cancer** (p. 18); **malaria** (p. 12, 16); **Mediterranean Sea** (p. 4); **Mencken, H. L.** (p. 10); **metabolism** (p. 9); **pacemaker** (p. 19); **penicillin** (p. 11); **plague** (p. 6); **rabies** (p. 9); **Reed, Walter** (p. 10); **scurvy** (p. 8).; **Semmelweis, Ignaz** (p.10); **Thomas, Lewis** (p.14); **Thoreau, Henry David** (p. 15); **totalitarian states** (p. 22); **tuberculosis** (p. 2, 6, 10-11); **typhoid** (p. 6, 16); **Vesalius, Andreas** (p. 5-6); **vitamins** (p. 20).

STUDY SUGGESTIONS ...

1. This book highlights the work of Louis Pasteur. Pasteur's contemporary and rival, Robert Koch, was equally interesting and influential. Investigate and report on the contributions of these two giants of science and health. And on their personal rivalries.

2. It is a sobering exercise to read the sad tales of epidemics of the past. Take one of the following and research and write a report on how serious it was and how it was eventually stopped. Tuberculosis, diphtheria, scurvy, rickets, cholera, polio, syphilis, smallpox, yellow fever, bubonic plague.

3. Compare the case you researched in question 2 with the havoc and uncertainty about present-day epidemics like AIDS, drug addiction, cancer or heart disease.

4. There is an old saying, "An ounce of prevention is worth a pound of cure." Compare the costs of disease and health before and after we learned to immunize people against a specific disease like smallpox or polio.

5. The history of drug addiction is sad, sobering and not very well known. Research in the library the history of addiction to such drugs as morphine, opium, cocaine, heroin, alcohol, tobacco and the psychedelic drugs. What insight does your research give on ways to successfully fight the ravages of drug addiction today.

6. In terms of numbers of people affected, the most serious damage to health and most open invitation to disease in this country comes from smoking cigarettes and abusing alcohol. What can and should be done about these threats? Discuss and debate in class.

7. Besides not drinking and driving, one other simple change in life style could save a significant number of lives–the use of selt belts in cars. Check out the statistics on seat belt use in your community or state. How can you get people to use seat belts?

8. Many people believe that modern times have made environmental pollution a much more serious problem than in earlier days. Check this out by reading in the bibliography and comparing statistics of harm caused by pollution problems of the past with those of today.

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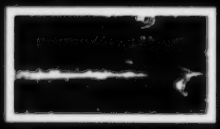

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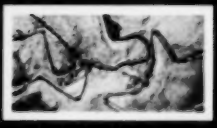

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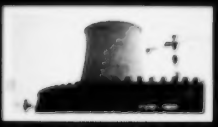

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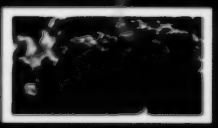

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